Development Economics

Lecture 15: Inequality

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ECON 2273

Today

1. Distribution of Resources
2. Measures of the distribution: inequality
    1. Distribution functions
    2. Quintiles, Deciles, Kuznets Ratio
    3. Lorenz Curve
    4. Designing a good inequality measure
    5. Gini Coefficient
    6. Other measures
3. Why we care about inequality?

Distribution of Resources

- The distribution of resources is who gets what in society
- The distribution of resources is a key factor in institutional framework of Acemoglu, Johnson and Robinson
  - Affects economic and political power, and through them economic growth
- Also useful and interesting to study the distribution of resources itself

Distribution of Resources

- Some economic resource (often income)
- Some group of N people
  - Assign each person a number
  - Analogy: assign each person a locker in the locker room, and call that person their locker number.
- Each individual in the population gets y_i of the economic resource
  - So person 152 gets y_{152} of resource
  - Analogy: put stuff in each person's locker, y_{152} is how much stuff is in locker 152

Distribution of Resources

- Want to describe
  - how much each person gets
  - how much each person gets *in comparison* to everybody else
- Some ways to describe distribution
  - Poverty: a description of how much the people with the least have
  - Inequality: how different the amounts each person gets are from everyone else
  - Mean and total: how much there is

Example: Sponsorship swag

- Many sports teams have sponsors who make some product (Nike, Adidas, Underarmor)
  - Give sports teams lots of free stuff
- Awards Ceremonies have sponsors as well
  - Oscar gift baskets ~$85,000 filled with stuff like a $4,000 leather travel bag from Victorinox
- Suppose this stuff gets divided up into the lockers
- Want to describe the various ways to distribute "swag" resources

Example: Sponsorship swag

- 10 person sports team
- $100 dollars worth of swag
- 10 lockers to put it in
- Compare three distributions
  - Everyone gets the same amount (ex. 10)
  - Varying: first 5 get 5, last 5 get 15
  - One person gets it all (ex. 1 person gets 100, everyone else gets 0)

Ways to describe a distribution

Mean and Total (irrespective of inequality in distribution)

- Total: sum of all resources
  - $Y = \Sigma_1^N y = 10 + 10 + \ldots + 10 + 10 = 100$
  - $Y = \Sigma_1^N y = 15 + 15 + \ldots + 5 + 5 = 100$
  - $Y = \Sigma_1^N y = 100 + 0 + \ldots + 0 + 0 = 100$

- Mean: amount each person gets if divided evenly
  - $Y/N = 100/10 = 10$ in all scenarios

Ways to describe a distribution

- Full distribution described by
  - Cumulative density function (CDF)
  - Probability density functions (PDF) or histogram
- But these are complicated, instead want to summarize and compare
  - Mean and total give amount of resources, but not how distributed
- Construct ways to measure inequality which summarize aspects of distribution
  - Deciles, Quintiles summarize in 10 and 5 numbers
  - An inequality measure summarizes in one number

Inequality: percentiles

Quintiles, Deciles and Centiles

- Divide population into groups, and determine portion of total each group gets
- Typical groups:
  - Quintiles: poorest fifth, second poorest fifth . . . richest fifth;
  - Deciles: poorest tenth . . . richest tenth
- Can also do in smaller segments: centiles are portion earned by each 1% of population
- Summarizes distribution into 5, 10, or 100 numbers
  - Reducing distribution to fewer numbers is not a big deal when have only 10 people, vastly reduces complication for an entire country

Inequality: **Quintiles, Deciles**

Dec	Even	5,15	One	Quin	Even	5,15	One
1.	10	5	0	1.	20%	10%	0%
2.	10	5	0				
3.	10	5	0	2.	20%	10%	0%
4.	10	5	0				
5.	10	5	0	3.	20%	20%	0%
6.	10	15	0				
7.	10	15	0	4.	20%	30%	0%
8.	10	15	0				
9.	10	15	0	5.	20%	30%	100%
10.	10	15	100				

Measure of inequality: Kuznets Ratio

Quintile ratios and Kuznets Ratio

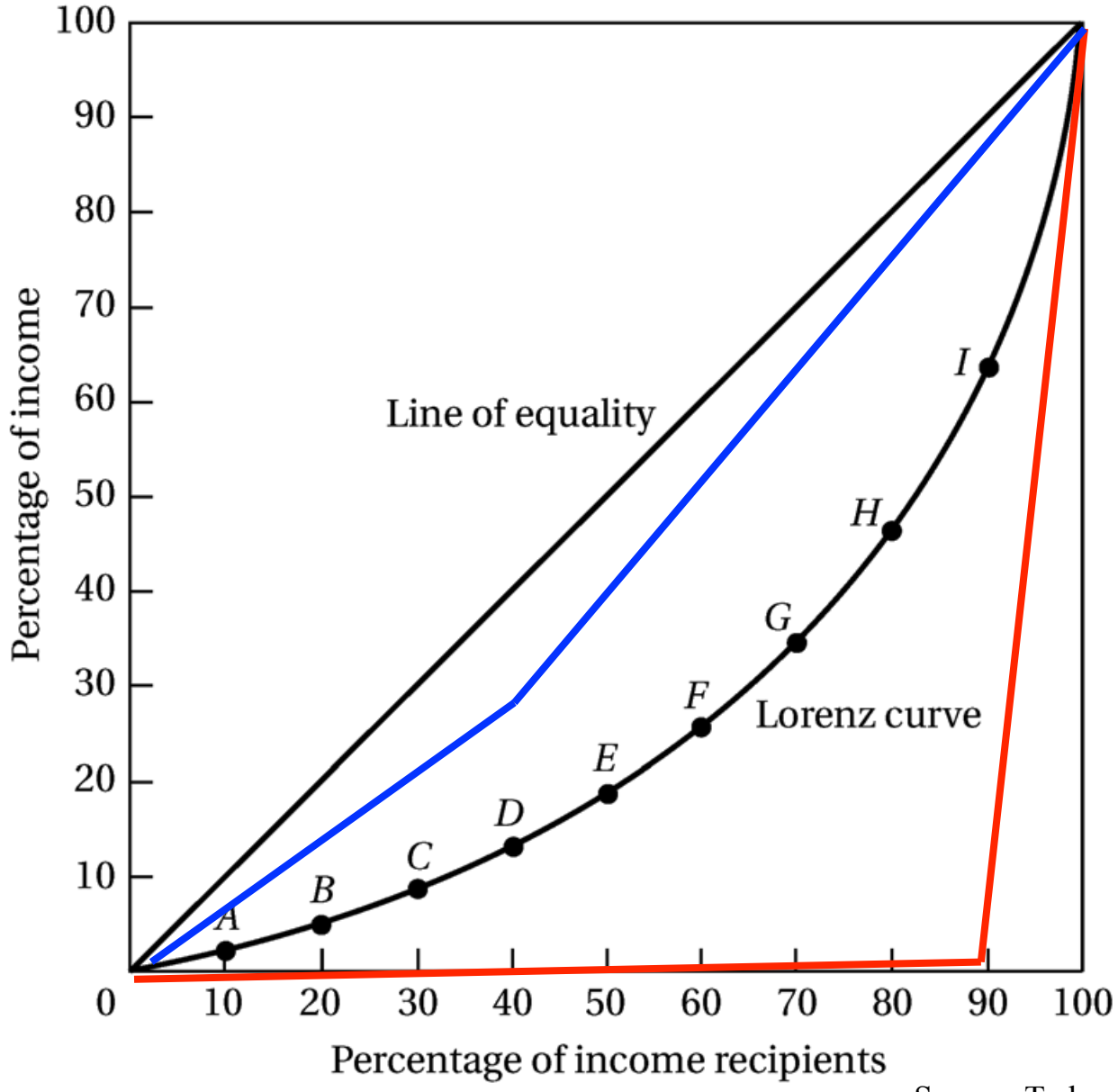
- Kuznets Ratio: ratio of top quintile to bottom two quintiles (top 20% to bottom 40%)
- More common is quintile ratio: Top quintile/Bottom quintile
- Also used quartile ratios . . . .
- Big advantage: Easy to compute!

Inequality: Lorenz Curve

The Lorenz Curve

- Arrange everyone in order. Plot cumulative percentage of people on x-axis (0-100) and the cumulative percentage of the resource on y-axis (0-100)
- Graph tells what percent of total resource the bottom x percent of people have
- Information is almost the same as cumulative density function,
  - but axis flipped
  - changes amount of resource into percentage of resource (only makes sense for positive values) so only learn about inequality, not about how much stuff

Inequality: Lorenz Curve swag

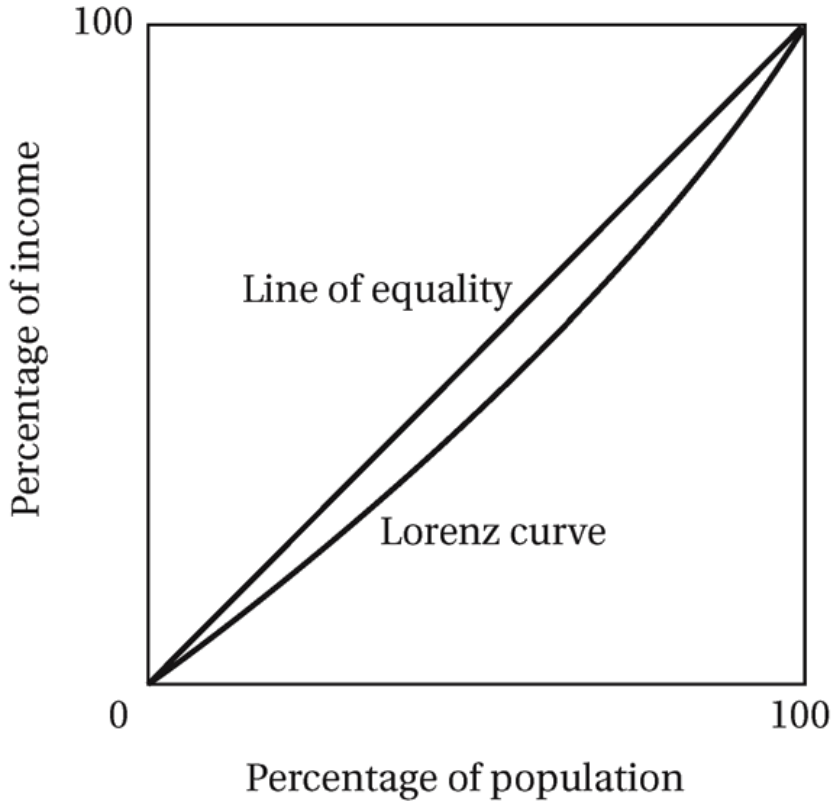


	Running Total	
Equal	5,15	One
10	5	0
20	10	0
30	15	0
40	20	0
50	25	0
60	40	0
70	55	0
80	70	0
90	85	0
100	100	100

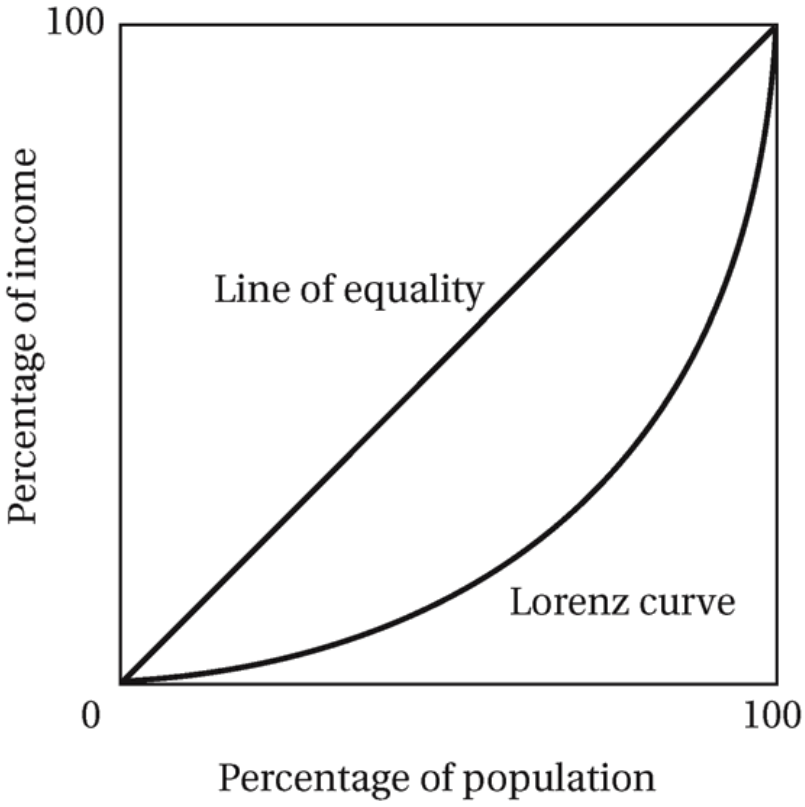
Source: Todaro and Smith.

Inequality: Lorenz Curve

The Lorenz curve helps compare distributions



(a) A relatively equal distribution

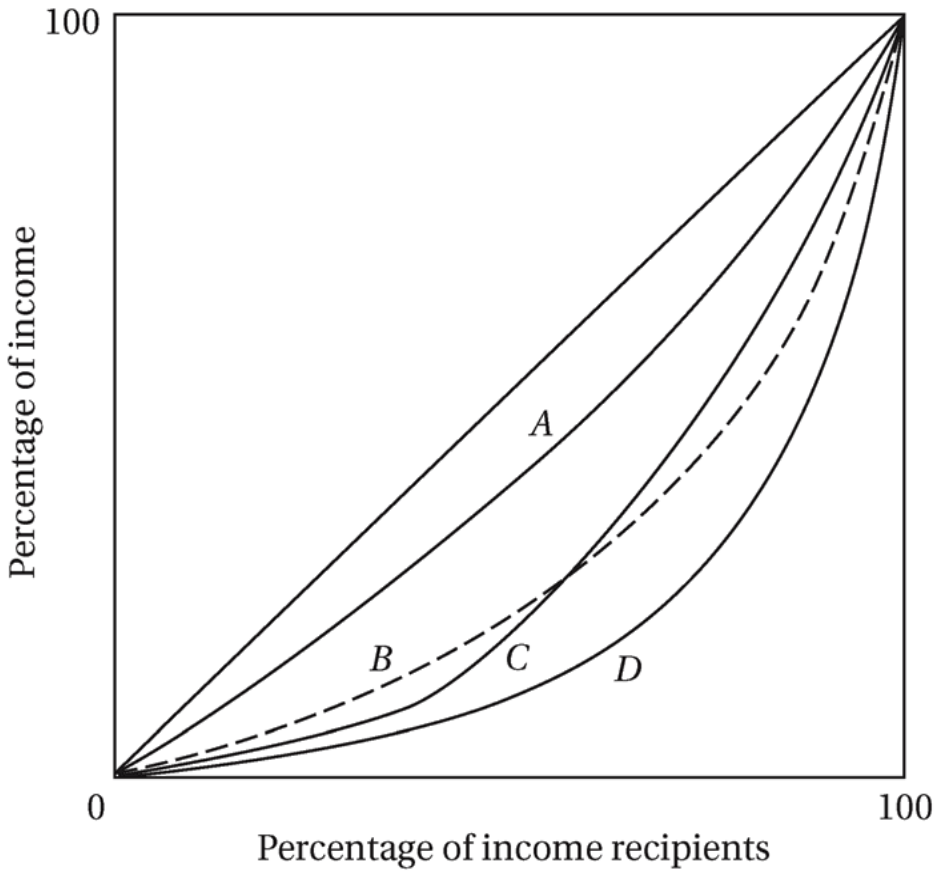


(b) A relatively unequal distribution

Source: Todaro and Smith.

Inequality: Lorenz Curve

- *Lorenz Criterion*: If the Lorenz curve for one distribution lies everywhere above (or along) another distribution then it represents a more equal distribution.
  - Also called *Lorenz Dominance* when one curve dominates the other (is everywhere higher)
- Perfect equality is 45 degree line
- Perfect inequality is the top person gets everything



Measure of inequality

- Need a way of comparing even when Lorenz curves cross
- Summarize the entire distribution into a single number: a measure of inequality
- Generally want to scale so that
  - 0 is perfect equality
  - 1 is perfect inequality
- Use that number to compare inequality
  - is it increasing or decreasing?
  - higher in one country than another?

Properties of a good inequality measure

1. *Anonymity Principle*
   - It does not matter who gets what
   - Example: the janitor switches all the locker numbers, so everyone gets a new locker, with a different amount of swag. The measure of inequality should not change (the lockers are no more or less equally filled now than they were before)

Properties of a good inequality measure

2. *Scale Independence Principle*

- The amount of resources (size of economy) does not matter, only the relative distribution
- Example: Suppose sponsor doubles the available swag, and everybody gets double the amount they had before. Relative positions unchanged, so measure of inequality should not change.

Properties of a good inequality measure

3. *Population Independence Principle*

- The population size does not matter
- Example: Suppose calculate inequality first for Men's locker room, then for Women's with the same distribution of lockers, then for everyone. Should get the same measure of inequality each time.

Properties of a good inequality measure

4. *Transfer Principle (Dalton Principle)*

- If transfer some resources from richer person to a poorer person (but not so much that the poorer person becomes richer than the originally richer person), then inequality should go down.
- Example: Person with most of the swag gives some to people with less. Inequality should go down.
- **Question:** Does the Kuznets Ratio satisfy the principle of transfers?
  - Ratio of Income Top 20% / Bottom 40%

Measure of inequality: Gini Coefficient

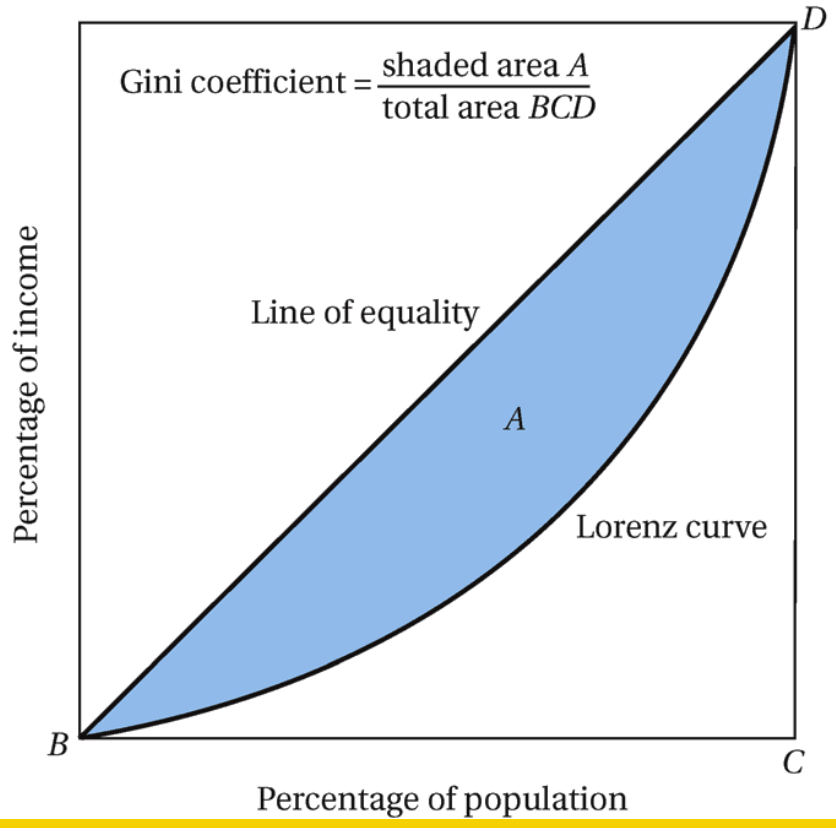
- Direct definition: The mean of all pairwise comparisons of income.
  - Take the sum of differences of person 1 from everyone else, then person 2, and so on (then normalize so between 0 and 1)

$$\gamma = \frac{1}{2N^2\mu} \sum_{j=1}^{N} \sum_{k=1}^{N} |y_j - y_k|$$

μ is mean income

N is population size

- Graphical definition: The area between the Lorenz Curve and the line of equality divided by total area



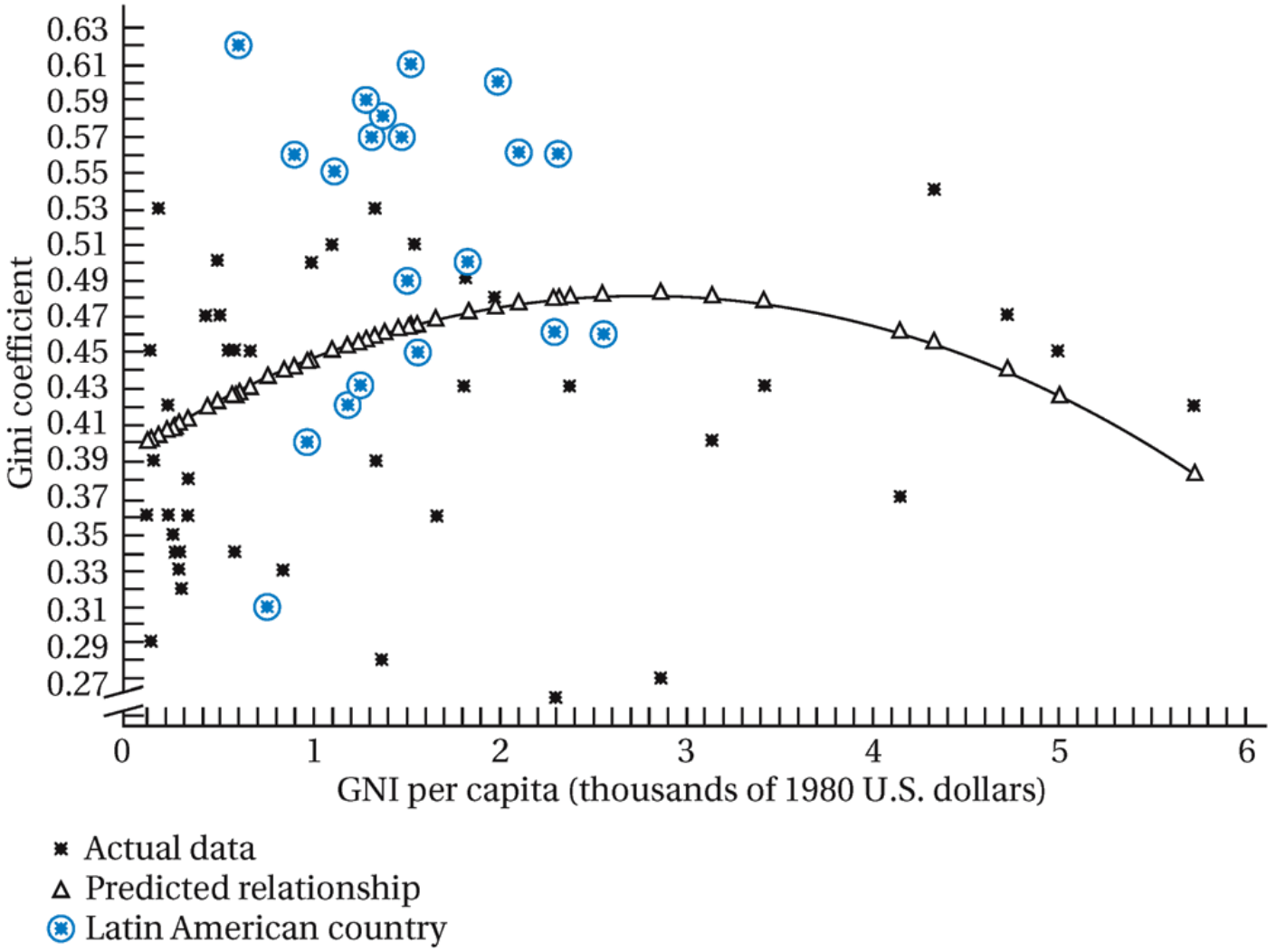
Other measures of inequality

- Coefficient of variation
  - Standard deviation / Mean
    - Meets all of the principles of good inequality measure
- Range
  - (Max – Min) / Mean
    - Does not satisfy the principle of transfers
- Interquartile Range
  - Income at 75% - Income at 25%
- Quintile Ratio's and Kuznets Ratio

Why do we care about inequality?

- It may have negative effects on growth
  - Poverty traps
  - Affect institutions
- But inequality may be a natural occurrence of the development process
- Kuznets Curve: an inverted U of inequality as countries develop
  - Early growth makes some people (in the modern sector) rich, and it is only over time that the formerly subsistence farmers move to the modern sector where they work for high wages, so inequality falls.
    - Profits in Big Push and Lewis Two-Sector models

Kuznets Curve



Source: Todaro and Smith.

Kuznets Curve Problems

- Driven by Latin America
- Cross-sectional
  - Individual countries don't seem to follow curve over time.
- Not clear that changes in inequality are a general feature of development
  - May reflect local institutions and affect growth, but not go through stages that are same for all countries

Measure of inequality: Gini of swag

$$\gamma = \frac{1}{2N^2\mu} \sum_{j=1}^{N} \sum_{k=1}^{N} |y_j - y_k|$$